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DIOPHANTINE ANALYSIS.

Conducted by J. M, COLAW, Monterey, Va. All contributions to this department should be sent to him.

SOLUTIONS OF PROBLEMS.

49. Proposed by **EDMUND FISH**, Hillsboro, Illinois.

A rectangular field, whose length and breadth in rods are in whole numbers, is enclosed with a fence and subdivided by fences on both diagonals, the total length of the fences being 2204 rods; required the sides and area.

I. Solution by **O. W. ANTHONY**, M. Sc., Professor of Mathematics, Columbian University, Washington, D. C.; **O. S. WESTCOTT**, North Division High School, Chicago, and the **PROPOSER**.

Let $2xy$, x^2-y^2, and x^2+y^2 be the length, breadth and diagonal of the field, respectively; then $2x^2+2xy=1102$.

$\therefore x^2+xy=551$; whence $y=\dfrac{551}{x}-x$, $=\dfrac{19\times29}{x}-x$.

As x and y are known to be integral, $551/x$ must be integral, which can only be when $x=19$. Hence $y=10$.

$\therefore 2xy=380$; and $x^2-y^2=261$, breadth.

II. Solution by **G. B. M. ZERR**, A. M., Ph. D., Texarkana, Arkansas.

Let x=length, y=breadth; then $2x+2y+2\sqrt{(x^2+y^2)}=2204$.

$\therefore 607202+xy=1102(x+y)$. $\therefore 1102-y=1102(551-y)/x$.

Let $1102-y=z$, then $z=1102(x-551)/x$.

$\therefore x=1102-(2.19^2.29^2/z)$. $\therefore z=29^2$. $\therefore x=380$, $y=261$.

Area=99180 square rods, =619 acres, 14 square rods.

III. Solution by **M. A. GRUBER**, A. M., War Department, Washington, D. C.; **JOSIAH H. DRUMMOND**, LL. D., Portland, Maine; **A. H. HOLMES**, Brunswick, Maine; and **P. S. BERG**, Larimore, North Dakota.

As the field is a rectangle, the diagonals are equal, and the fences form the sides of two equal right triangles of which the legs and hypotenuse are respectively the sides and diagonal of the field.

Let a and b be the sides and c the diagonal of the field. Then $2a+2b+2c=2204$, and $a^2+b^2=c^2$. From the identity $(2mn)^2+(m^2-n^2)^2=(m^2+n^2)^2$, the formula for finding integral sides of right triangles, take $a=2mn$, $b=m^2-n^2$, and $c=m^2+n^2$. Then $2a+2b+2c=4m(m+n)=2204$. Whence $m(m+n)=551$. We now separate 551 into two factors, making the larger factor equal $m+n$, and the smaller equal m.

$551=19\times29$. Then $m+n=29$ and $m=19$; whence $n=10$. Substituting these values of m and n in the values for a, b, and c, we obtain $a=2mn=380$= the length of the field; $b=m^2-n^2=261$=the breadth of the field; and $c=m^2+n^2=461$=the diagonal of the field. The area$=380\times261=99180$ square rods$=619\frac{7}{8}$ acres.

Also solved by *A. H. BELL*.